

Description

ADJUSTABLE CHAIR

BACKGROUND OF INVENTION

[0001] The present invention relates to chairs having a height adjustment. It finds particular application in conjunction with bathing chairs and will be described with particular reference thereto. It will be appreciated, however, that the invention is also amenable to other applications.

[0002] Adjustable chairs are useful for assisting disabled persons while bathing. Depending on the type and/or severity of the disability, a person may prefer or have no choice but to sit while bathing. In this case, it is desirable to use a chair having a seat easily adjustable to various heights. Furthermore, because the terrain of the bathing area (e.g., a tub or shower) may be uneven, it is also desirable that the legs be independently adjustable to accommodate even slight irregularities in the surface of the bathing area while ensuring that the seat is level (e.g., parallel to the ground).

[0003] One conventional chair used for assisting disabled per-

sons while bathing includes a leg having an upper portion secured to an underside of a seat. A continuously threaded section extends from the upper portion of the leg. A lower portion of the leg includes a hollow cavity with continuous threads that mate with the threaded section of the upper portion. The threaded section of the upper portion is screwed into the cavity of the lower portion until a desired height of the seat is attained. Furthermore, the height of the seat is adjusted by turning (e.g., screwing and/or unscrewing) the threaded section of the upper portion to a new position within the cavity.

[0004] Although the mating threads on the respective portions of the legs provide a means for adjusting a height of the seat, no means for indexing the height of the legs and/or comparing the height of one leg of the chair with respect to any of the other legs is provided. Therefore, assembling the chair to sit on a relatively flat surface requires a trial-by-error approach whereby a user makes a first attempt at adjusting the legs to achieve a level seat. Then, the user places the chair on the ground and makes the necessary adjustments to the heights of the respective legs until the seat is level and, furthermore, the desired height of the seat is achieved. Obviously, this multi-step

process of leveling the seat at a desired height is cumbersome.

[0005] Furthermore, conventional bathing chairs having independently attachable legs do not offer desired levels of stability.

[0006] Also, the seat portions of conventional bathing seats are not curved in a way that creates a perception of a more accommodating seat.

[0007] The present invention provides a new and improved apparatus and method which addresses the above-referenced problems.

SUMMARY OF INVENTION

[0008] In one embodiment, an adjustable leg for a chair includes a leg housing, secured to a seat, that includes a threaded inner wall. A leg extension is received into the leg housing and includes external threaded portions that mate with the threaded inner wall. A tab in the leg housing cooperates with the external threaded portions and secures the leg extension at a predefined position in the leg housing.

[0009] In another embodiment, an adjustable leg for a chair includes a leg housing secured to a seat. An insert is secured in the leg housing and includes a threaded inner wall. A leg extension is received into the insert and in-

cludes external threaded portions that mate with the threaded inner wall. A depression is defined between the threaded portions. A tab on the insert cooperates with the threaded portions and the depression. The leg extension is secured at a predefined position in the insert when the tab is in the depression.

[0010] In another embodiment, a chair has an adjustable leg. The leg includes an upper leg portion secured to a seat. An insert is secured in the upper leg portion and includes a threaded inner wall. A lower leg portion is received in the insert and includes a partial external threaded portion, which mates with the threaded inner wall, and a valley. A means provides visual and tactile feedback to a user when the lower leg portion is at a predetermined position in the upper leg portion.

[0011] In another embodiment, an adjustable leg for a chair includes a leg housing secured to a seat. A leg extension is received into the housing and includes external threaded portions that mate with a threaded inner wall of the leg housing. A plurality of indices are between the threaded portions on the leg extension. A locking mechanism is associated with the leg housing. Preset positions of the leg extension within the housing are determined as a function

of respective ones of the indices being engaged with the locking mechanism.

[0012] In another embodiment, a method for adjusting a leg of a chair includes rotating a leg extension within an insert that is secured within a leg housing. External threaded portions of the leg extension mate with a threaded inner wall of the insert as the leg extension is rotated. When the leg extension is at a predefined position in the insert, a tab on an inner surface of the insert engages in a valley between the threaded portions.

BRIEF DESCRIPTION OF DRAWINGS

[0013] In the accompanying drawings which are incorporated in and constitute a part of the specification, embodiments of the invention are illustrated, which, together with a general description of the invention given above, and the detailed description given below, serve to exemplify the embodiments of this invention.

[0014] *FIGURE 1* illustrates an exploded view of a chair in accordance with one embodiment of the present invention;

[0015] *FIGURE 2* illustrates a top of the seat portion in accordance with one embodiment of the present invention;

[0016] *FIGURE 3* illustrates a bottom of the seat portion in accordance with one embodiment of the present invention;

- [0017] *FIGURES 4–17* illustrate various cross-sectional views through the bottom of the seat portion in *FIGURE 3*;
- [0018] *FIGURE 18* illustrates an exploded view of a leg housing, an insert, and a leg extension in accordance with one embodiment of the present invention;
- [0019] *FIGURE 19* illustrates a sectional view of the insert in accordance with one embodiment of the present invention;
- [0020] *FIGURE 20* illustrates the leg insert in accordance with one embodiment of the present invention;
- [0021] *FIGURE 21* illustrates another embodiment of the present invention; and
- [0022] *FIGURE 22* illustrates another embodiment of the present invention.

DETAILED DESCRIPTION

- [0023] With reference to *FIGURE 1*, a chair *10* according to the present invention includes a seat portion *12*, a back portion *14*, and a plurality of leg housings *16a, 16b, 16c, 16d* secured to the seat portion *12*. Although four (4) leg housings *16a, 16b, 16c, 16d* are shown in the illustrated embodiment, it is to be understood that other numbers of leg housings are also contemplated. A plurality of leg extensions *20a, 20b, 20c, 20d* are received in respective inserts *18a, 18b, 18c, 18d*, which are secured in the leg housings

16a, 16b, 16c, 16d.

[0024] With reference to *FIGURE 2*, a top portion 22 of the seat portion 12 includes a plurality of holes 24 for providing drainage. A plurality (e.g., two (2)) of hand grips 26a, 26b are also provided.

[0025] With reference to *FIGURE 3*, a bottom portion 30 of the seat portion 12 includes a plurality of housing receiving portions 32a, 32b, 32c, 32d, which are designed to mate with an upper portion 34a (see *FIGURE 16*) of the leg housing 16a (see *FIGURE 18*). *FIGURES 4–7* illustrate cross-sectional views of the housing receiving portion 32a. *FIGURES 8–11* illustrate cross-sectional views of the housing receiving portion 32b. *FIGURES 12 and 13* illustrate cross-sectional views of the housing receiving portion 32c. *FIGURES 14 and 15* illustrate cross-sectional views of the housing receiving portion 32d.

[0026] With reference again to *FIGURE 3*, each of the housing receiving portions 32a, 32b, 32c, 32d is a pocket having a triangular lobe geometry. Each of the pockets is deep enough (e.g., at least about 2.0 inches deep) for providing adequate contact area between the housing receiving portions 32a, 32b, 32c, 32d and the respective leg housings 16a, 16b, 16c, 16d to increase lateral stability. Furthermore, the

pocket design of the housing receiving portions *32a*, *32b*, *32c*, *32d* provides for easy interchangeability between various leg extensions *20a*, *20b*, *20c*, *20d* (see *FIGURE 1*) (e.g., leg extensions made from different materials such as composite materials and/or metals including aluminum).

[0027] *FIGURES 16 and 17* illustrate cross-sectional views through the seat portion *12*. A seating surface *33* of the seat portion *12* is dished in such a fashion that a center *33a* of the seating surface *33* is lower than an outer edge *33 b* of the seating surface *33*. Also, a depth *35* (front to back) of the seating surface *33* area is less than a width *37* (side to side) of the seating surface *33* area. The gradual radius and seating surface proportions provides a smooth and comfortable surface that cradles the user. In one embodiment, the center *33 a* of the seating surface *33* is lower than the outer edge *33 b* by about 0.875 inches, the depth *35* is about 75% of the width *37*, and the dished surface is radius at about 60 inches; however, other embodiments, which include other dimensions, are also contemplated.

[0028] *FIGURE 18* illustrates a perspective view of the leg housing *16a*, the insert *18a*, the leg extension *20a*, and a tip portion *36a*, which is secured to a bottom of the insert *18a*. The top portion *34a* includes locking tabs (one of which is il-

illustrated as *40a* and one of which is not shown). The locking tabs *40a* cooperate with openings *42a1*, *42a2* (see *FIGURES 3–5*) in the respective housing receiving portion *32a* (without the use of tools) to secure the leg housing *16a* to the housing receiving portion *32a*. The locking tabs *40a* are biased in an outward direction from the housing receiving portion *32a* to facilitate engagement in the openings *42a1*, *42a2*. In the illustrated embodiment, the locking tabs *40a* are of a sufficient length and positioned on substantially opposite sides of the top portion *34a* for facilitating disengagement of the top portion *34a* from the housing receiving portion *32a* when a user merely uses a single hand for performing the disengagement. In one embodiment, the tip portion *36a* is a non-skid material (e.g., a material that may be injection molded as a soft substance such as rubber or Sarlink from DSM, Inc.) that improves traction with a ground surface.

[0029] In the illustrated embodiment, the insert *18a* includes a plurality (e.g., two (2)) portions *18a1*, *18a2*. Each of the portions *18a1*, *18a2* includes an internally threaded wall portion *44a1*, *44a2*. Furthermore, one of the portions *44a2* includes a flexing portion *46* (see *FIGURE 19*) and a tab *50* (see *FIGURE 19*) (locking device or mechanism) on the inner

wall. In one embodiment, the tab 50 includes a well (recessed portion), which is defined by walls of the flexing portion 46. The portions 18a1, 18a2 are assembled together to form the insert 18. When the portions 18a1, 18a2 are secured together, the internally threaded wall portions cooperate to form a continuous internally threaded wall on the insert 18. Also, the tab 50 is biased toward a center of the insert 18 by the flexing portion 46. The insert 18a is frictionally secured in a cavity at the bottom end of the leg housing 16a.

[0030] With reference to *FIGURE 20*, the leg extension 20a includes a plurality (e.g., two (2)) of external threaded portions 52a1, 52a2 and a plurality of indicators 54 (indices), which are positioned along a longitudinal axis of the leg extension 20a and between the threaded portions 52a1, 52a2. The threaded portions 52a1, 52a2 are raised with respect to a remainder of the portion 56 (e.g., valley or depression) between the threaded portions 52a1, 52a2. In one embodiment, the indicators 54 are also raised with respect to the portion 56. The threaded portions 52a1, 52a2 of the leg extension 20a are sized for mating with the internally threaded wall of the insert 18a (see *FIGURE 18*). Therefore, the leg extension 20a is drawn into (or extended from) the

insert *18a* (see *FIGURE 18*) and the leg housing *16a* (see *FIGURE 18*) as the leg extension *20a* is rotated. The leg extension *20a* also includes a collar *58*, which abuts the insert *18* (see *FIGURE 18*) when the leg extension *20a* is fully extended from the housing *16a* (see *FIGURE 18*). In this manner, the collar *58* prevents the leg extension *20a* from being completely unscrewed from the housing (see *FIGURE 18*).

[0031] With reference again to *FIGURE 18*, as the leg extension *20a* is drawn into the leg housing *16a*, the tab *50* rides on (over) the threaded portions *52a1*, *52a2* and also rides in the portion *56* between the threaded portions *52a1*, *52a2*. The edges of the threaded portions *52a1*, *52a2* are sloped to cooperate with the oncoming edge of the tab *50* as the leg extension *20a* is rotated into the insert *18a*. More specifically, as the leg extension *20a* is rotated into the insert *18a* and the leg housing *16a*, the tab *50* rides over one of the threaded portions *52a1*, into the space *56* between the threaded portions *52a1*, *52a2*, and then over the other of the threaded portions *52a2*. The sloped edges of the threaded portions *52a1*, *52a2* ease the transition of the tab *50* from the space *56* between the threaded portions to the next threaded portion *52a1*, *52a2*. Consequently, a user

screwing the leg extension *20a* into the insert *18a* feels resistance as the tab *50* transitions from one of the threaded portions *52a1*, *52a2*, to the space *56* between the threaded portions, and then to the other of the threaded portions *52a1*, *52a2*.

[0032] The leg extension *20a* is secured in the insert *18a* when the tab *50* is in the space *56* between the threaded portions *52a1*, *52a2*. The number of the indicators *54* exposed from the insert *18a* represent a length of the leg extension *20a* extending from the insert *18a*.

[0033] In another embodiment, the well defined by the tab *50* is sized to be seated over and surround the indicators *54* included on the leg extension *20a*. More specifically, as the tab *50* encounters the first one of the indicators *54*, the flexing portion *46* causes the first wall of the tab *50* to move over the indicator *54* (index). Then, as the user continues to turn the leg extension *20a*, the indicator *54* becomes removably secured in the well between the two walls of the tab *50*. The respective indicators *54* become secured in the tab *50* at predetermined (preset) positions in the insert *18a* (and the leg housing *16a*). Therefore, a length of the leg extension *20a* extending from the leg housing *16a* is related to the indicator *54* secured by the

tab 50. In other words, the user may determine the length of the leg extension 20a extending from the leg housing 16a by observing which one of the indicators 54 is secured by the tab 50. Then, the user may determine the length of the leg extension 20a extending from the leg housing 16a as a function of the indicator 54 secured by the tab 50.

[0034] When the indicator 54 is secured in the well defined by the tab 50, the user feels resistance when turning the leg extension 20a. By exerting enough force, the user can turn through the resistance so that the indicator 54 is disengaged from the tab 50 and the tab 50 begins riding over the next one of the threaded portions 52a1, 52a2. The increased resistance the user feels as the tab 50 encounters the indicators 54 provide a means of tactile feedback to the user regarding the amount of the leg extension 20a extending from the leg housing 16a. Furthermore, in one embodiment, the indicators 54 are numbers in numerical order that provide a means of visual feedback to the user regarding the amount of the leg extension 20a extending from the leg housing 16a.

[0035] It is expected that the respective indicators 54 on the various leg extensions 20a, 20b, 20c, 20d (see FIGURE 1) will be utilized by the user to adjust all of the legs to a common

height. For example, if the tabs *50* on the respective leg housings *16a*, *16b*, *16c*, *16d* are secured over a corresponding one of the indicators *54* on each of the leg extensions *20*, the seat portion *12* will be substantially level if the chair *10* is placed on a level surface.

[0036] Although only one of the leg housings *16a*, inserts *18a*, and extensions *20a* have been illustrated, it is to be understood the other leg housings, inserts, and extensions are assembled in a similar manner.

[0037] Each of the top portions *34 a*, *34b*, *34c*, *34d* is shaped to fit within the respective housing receiving portions *32a*, *32b*, *32c*, *32d* (see *FIGURE 3*) in a single orientation, thereby helping to assure correct assembly. Furthermore the top portions *34 a*, *34b*, *34c*, *34d* are shaped as triangular lobes including straight, flat surfaces for distributing forces in the leg housings *16a*, *16b*, *16c*, *16d* and the leg extensions *20a*, *20b*, *20c*, *20d*, which are generated by a user moving on the seat portion *12* (see *FIGURE 1*). Because such forces are distributed over a relatively large area, internal stresses acting on the top portions *34 a*, *34b*, *34c*, *34d* are reduced. The flat surfaces also reduce rocking when the user moves on the seat portion, thereby reinforcing the user's perception regarding the stability of the chair.

[0038] *FIGURE 21* illustrates another embodiment of the present invention. For ease of understanding this embodiment, like components are designated by like numerals with a primed (') suffix and new components are designated by new numerals. In this embodiment, a leg housing 60 includes an internally threaded wall 62. Therefore, the leg extension 20' screws directly into the leg housing 60. A locking mechanism 64 (tab) on the leg housing 60 interacts with the depression between threaded portions on the leg extension 20' as described above.

[0039] *FIGURE 22* illustrates another embodiment of the present invention. In this embodiment, telescoping legs 70a, 70b, 70c, 70d made from a non-composite material (e.g., metal such as aluminum) include respective upper portions 72a, 72b, 72c, 72d having the triangular lobe shape for mating with the housing receiving portions 32a, 32b, 32c, 32d (see *FIGURE 3*).

[0040] While the present invention has been illustrated by the description of embodiments thereof, and while the embodiments have been described in considerable detail, it is not the intention of the applicants to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily ap-

pear to those skilled in the art. Therefore, the invention, in its broader aspects, is not limited to the specific details, the representative apparatus, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of the applicant's general inventive concept.